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# What Firms' Surveys Tell Us about Price-Setting Behavior in the Euro Area\*

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This study investigates the pricing behavior of firms in the euro area on the basis of surveys conducted by nine Eurosystem national central banks, covering more than 11,000 firms. The results, consistent across countries, show that firms operate in monopolistically competitive markets, where prices are mostly set following markup rules and where price discrimination is common. Around one-third of firms follow mainly time-dependent pricing rules, while two-thirds allow for elements of state dependence. The majority of the firms take into account both past and expected economic developments in their pricing decisions. Price reviews happen with a low frequency, of about one to three times per year in most countries, but prices are actually changed even less. Hence, price stickiness arises at both stages of the price-setting process and is mainly driven by customer relationships—explicit and implicit contracts—and coordination failure. Firms adjust prices asymmetrically in response to shocks: while cost shocks have a greater impact when prices have to be raised than when they have to be reduced, a fall in demand is more likely to induce a price change than an increase in demand.

JEL Codes: E30, D40.

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\*This paper is based on the results of national studies conducted in the context of the Eurosystem Inflation Persistence Network (IPN). All of the authors belong to the national central banks that have been involved in Research Group 8 of the IPN (“Launching a Survey”) except Bettina Landau, who is with the European Central Bank. The other members of Research Group 8, who are also the authors of national studies and whose contribution to this paper has been crucial, are Luis Álvarez, Luc Aucremanne, Josef Baumgartner, Angela Gattulli, Marco Hoeberichts, Patrick Lünemann, Pedro Neves, Roland Ricart,

## 1. Introduction

In recent decades, a substantial amount of theoretical research devoted to improving the microeconomic foundations of macroeconomic behavior has shown that the nature of nominal rigidities plays a key role in determining the effects of different shocks on the economy. This theoretical research has made clear that a thorough understanding of the extent and causes of the sluggish adjustment of nominal prices is crucial to the design and conduct of monetary policy. In this respect, empirical work aimed at an improved characterization of the price-setting behavior of firms is of major interest for monetary policymaking. The objective of this paper is to deepen our understanding of the behavioral mechanisms underlying price setting by using a methodological approach—asking firms directly about how they set prices—that is particularly well suited for the purpose at hand.

Although the literature based on microdata has recently provided detailed descriptions of the periodicity and magnitude of price changes for a number of economies (on consumer prices see Bils and Klenow 2004 for the United States and Dyhne et al. 2005 for the euro area; on producer prices, see Álvarez et al. 2005 for the euro area), these quantitative characterizations of price dynamics are often not enough to understand the underlying rationale of the behavior of price setters. There are certain aspects of firms' pricing

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policies that can only be investigated on the basis of the qualitative information obtained from surveys. For example, firms' responses can provide valuable insights about the type of information set used in the review of prices. Furthermore, survey results allow us to investigate separately the two stages of the price-adjustment process (i.e., the review stage and the implementation stage), to empirically assess alternative theories on price stickiness, and to test whether the response of prices to shocks differs depending on the nature (costs/demand) or the sign of the disturbances. Finally, they are also useful in cross-checking the evidence obtained from quantitative databases.

The use of surveys to explore the price-setting behavior of firms was pioneered by the seminal work of Blinder (1991, 1994) and Blinder et al. (1998) for the United States.<sup>1</sup> This work has led to the conducting of similar surveys in other countries: Köhler (1996) in Germany; Hall, Walsh, and Yates (1997, 2000) in the United Kingdom; Apel, Friberg, and Hallsten (2005) in Sweden; and Amirault, Kwan, and Wilkinson (2004) in Canada.

Within this line of research, this paper provides an in-depth study of the price-setting mechanism in the euro area, based on the evidence obtained from surveys conducted in 2003 and 2004 in nine euro-area countries—Austria (AT), Belgium (BE), France (FR), Germany (DE), Italy (IT), Luxembourg (LU), the Netherlands (NL), Portugal (PT) and Spain (ES)—covering 94 percent of euro-area GDP.<sup>2</sup> The surveys display a sufficiently high degree of comparability across countries, despite the adoption of a decentralized approach in their design. Thus, a number of common characteristics can be observed in the full set of results from all of the countries. The country coverage and the high comparability of the

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<sup>1</sup>For a very early example of this kind of work, see Hall and Hitch (1939).

<sup>2</sup>The detailed results for each country can be found in the country-specific studies conducted in the framework of the Eurosystem IPN: Kwapił, Baumgartner, and Scharler (2005) for Austria; Aucremanne and Druant (2005) for Belgium; Loupias and Ricart (2004) for France; Stahl (2005) for Germany; Fabiani, Gattulli, and Sabbatini (2004) for Italy; Lünemann and Mathä (2006) for Luxembourg; Hoeberichts and Stokman (2006) for the Netherlands; Martins (2005) for Portugal; and Álvarez and Hernando (2005) for Spain. These studies can be downloaded from the European Central Bank website (ECB working papers).

national surveys imply that these common features may be regarded as “stylized facts” underlying the price-setting mechanism in the euro area. It is worth remarking that such features should be interpreted as referring mainly to producer prices in the manufacturing sector, which is overrepresented in most of the national samples. Nevertheless, results for the trade and services sectors, which are covered only in some countries, give indication about both producer and consumer prices.

One of our key findings is that firms engage in both time-dependent and state-dependent pricing strategies. Around one-third of the respondents indicate that they follow mainly time-dependent rules, while two-thirds use rules with state-dependent elements. With regard to the information set considered in the price-setting process, our results show that, while the majority of firms in the euro area take into account both past and expected developments, about one-third of them adopt a purely backward-looking behavior. Furthermore, our results are in line with the idea that price setting takes place in two stages: first, firms review their price to check whether it deviates from its optimal level; then, if this is the case, they decide whether to change the price or not. The surveys suggest that the modal number of price reviews ranges in most countries between one and three times per year, while the median firm in nearly all countries changes its price only once a year. Hence, there appear to be obstacles to price adjustment at both stages of price setting, although the main impediments seem to lie at the second stage. The respondents indicate that customer relationships are the main source of price rigidities. In particular, the fear of antagonizing customers with frequent price changes seems to be the most important explanation for price stickiness in the euro area. Finally, we find that prices react asymmetrically to shocks: they are more rigid upwardly in response to demand shocks and are more rigid downwardly in response to cost shocks.

The structure of the paper follows the different stages of the price-setting process. Section 2 reports the main characteristics of the national surveys. Section 3 deals with the price-reviewing stage and provides evidence on the time- or state-dependent nature of firms’ pricing policies, the information set used, and the frequency of price reviews. Section 4 investigates how firms set prices, documents the frequency of price changes, and explores the empirical support of

alternative theories on price stickiness. The factors underlying price setting are analyzed in section 5. Finally, section 6 concludes.

## 2. How the Surveys Were Carried Out

The national surveys were designed following a decentralized approach, and this explains some differences in the way they were carried out (for a detailed analysis of these differences, see Appendix B in Fabiani et al. 2005). The surveys were conducted either by phone, Internet, or traditional mail; a small number took the form of face-to-face interviews with one of the senior managers. The number of respondents in each country ranges from 333 to 2,008; altogether, more than 11,000 euro-area companies of different sizes in terms of number of employees were surveyed. All national surveys focus on the pricing behavior with respect to the firm's main product, which is found to account for 60 percent or more of the turnover of the respondents.

The sectoral coverage is limited to manufacturing in some countries, while in other countries, pricing strategies in construction, trade, and services are also investigated.<sup>3</sup> In general, there is some overrepresentation of the industrial sector in most of the national samples, which explains why the majority of companies (75 percent on average) indicate that they sell their main product predominantly to other firms. Overall, in spite of the differences in the sectoral coverage, there is quite a solid basis for comparing the industrial and the services sectors across countries.

The questionnaires differ with respect to the reference market, which in some countries (DE, FR, and LU) is the domestic market and in others (BE, ES, IT, and AT) is the main market (in the remaining countries it is not specified). However, reliable results for the euro area can be computed, since the majority of respondents, especially in the industrial sector, refer to their pricing strategies either in the domestic market or in the euro area.

It is worth emphasizing that the above minor differences across the national questionnaires represent an important value added of

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<sup>3</sup>For details on the composition of the samples of the national surveys, see Fabiani et al. (2005). Detailed information on the sampling methods can be obtained from the country-specific studies (see footnote 2).

this research project compared to previous empirical literature. In particular, the common patterns detected across countries (“stylized facts”) do not appear to depend on the particular way the national surveys were conducted, the number of questions asked, the precise wording and order of the questions, and the options within a particular question. Therefore, compared to other previous studies, the results for the euro area reported in this paper are characterized by a higher degree of robustness that is further strengthened by the fact that the nine national surveys were carried out under different business-cycle conditions. This consistency of findings across countries lessens to some extent the potential significance of the drawbacks traditionally attached to the use of surveys: first, the qualitative nature of the information gathered, which sometimes makes it difficult to ascertain the precise importance of a given statement; second, the lack of a time dimension, which means that they cannot be used to assess whether pricing patterns change over time; and, finally, the degree of uncertainty that surrounds the quality of the answers provided by the respondents.

### 3. Price Reviews

This section documents the main features of the first step of the price-adjustment process—the one in which firms evaluate the price they want to set, taking into account the information they have and checking whether it coincides with the price they currently charge.

#### *3.1 Time-Dependent versus State-Dependent Pricing Rules*

Individual firms do not continuously adjust their prices in response to all the relevant shocks in the economy. To model this fact, the theoretical literature considers mainly two types of pricing behavior: time-dependent pricing rules and state-dependent ones. According to the former, either with a deterministic (Taylor 1980) or a stochastic (Calvo 1983) process of price adjustment, firms review their prices periodically, i.e., the timing of the review is exogenous and does not depend on the state of the economy.

Firms following state-dependent rules review their prices whenever there is a large-enough shock. A standard justification for this type of discontinuous adjustment is the existence of a fixed cost

of changing prices (see, for instance, Sheshinski and Weiss 1977; Caballero and Engel 1993; or Dotsey, King, and Wolman 1999). The existence of price-adjustment costs implies in state-dependent models that firms change their price only when the latter gets sufficiently “out of line” and, consequently, price reviews are likely to be a lot more frequent than price changes, as firms want to be aware of shocks in order to react as fast as possible. In time-dependent models, firms review—and change, if they find it optimal to do so—their price only on a periodic basis.

In the presence of shocks, time dependence might lead to stickier prices than state dependence. Hence, almost every national questionnaire investigates whether firms follow mainly time-dependent pricing rules, state-dependent pricing rules, or a combination of both. In this latter case, the idea is that firms can follow time-dependent rules as an implementation of state-dependent ones under a stable environment (as in Sheshinski and Weiss 1977) rather than purely time-dependent rules. To distinguish between these two groups, some national questionnaires asked firms whether they switch to state-dependent rules upon the occurrence of specific events.

Given that the firms following mainly time-dependent rules or both strategies are supposed, under certain assumptions, to introduce more rigidity in the price transmission mechanism than those following mainly state-dependent rules, our analysis focuses on cross-country comparisons of the share of mainly time-dependent firms (table 1, panel A) and of those that follow both types of rules (table 1, panel B).

In the euro area as a whole, 34 percent of the firms follow purely time-dependent rules; the share is roughly around 35–40 percent for six countries (FR, ES, IT, NL, AT, and PT) and below 30 percent for three countries (BE, DE, and LU). These results are in line with those obtained by Blinder et al. (1998), who report that in the United States 40 percent of the firms undertake meaningful periodic price reviews. Overall, the results are also rather similar to the figures reported by Apel, Friberg, and Hallsten (2005) for Sweden, where only 23 percent of the firms are found to follow time-dependent pricing rules when significant events occur. The evidence for the United Kingdom by Hall, Walsh, and Yates (2000), however, differs from the above-mentioned results, as 79 percent of the firms are found to be time dependent (10 percent follow both time- and state-dependent



**Table 1. Firms' Price-Setting Rules**  
*(Percentages)<sup>a</sup>*

<b>A. Firms Following Time-Dependent Rules</b>								
	<b>Total</b>	<b>Sector</b>			<b>Perceived Competition<sup>d</sup></b>			
		goods	trade	services	very low	low	high	very high
<b>BE</b>	26	22	29	24	25	23	22	19
<b>FR<sup>b</sup></b>	39	39	—	—	—	—	—	—
<b>DE</b>	26	26	—	—	27	21	25	33
<b>ES</b>	33	29	32	40	42	32	29	31
<b>IT</b>	40	40	35	45	37	35	51	19
<b>LU</b>	18	23	16	14	25	14	10	25
<b>NL</b>	36	26	34	40	35	36	35	36
<b>AT</b>	41	37	—	44	42	34	39	35
<b>PT</b>	35	32	—	63	47	42	38	25
<b>Euro Area<sup>c</sup></b>	<b>34</b>	<b>32</b>						
<b>B. Firms Following Both Time- and State-Dependent Rules</b>								
<b>BE</b>	40	42	36	48	43	40	44	38
<b>FR<sup>b</sup></b>	55	55	—	—	—	—	—	—
<b>DE</b>	55	55	—	—	51	64	58	45
<b>ES</b>	28	25	24	34	18	29	33	31
<b>IT</b>	46	45	62	26	45	53	43	40
<b>LU</b>	32	27	39	32	25	39	33	27
<b>NL</b>	18	19	21	16	12	18	16	24
<b>AT</b>	32	36	—	29	35	37	36	39
<b>PT</b>	19	23	—	17	14	19	22	28
<b>Euro Area<sup>c</sup></b>	<b>46</b>	<b>46</b>						

<sup>a</sup>Share of respondents following time-dependent or both time- and state-dependent pricing rules. Figures for the third category, the share of firms following only state-dependent rules, are not shown, but they are the complement to 100 by column. The figures are not supposed to add up to 100 by row. The figures are rescaled excluding nonresponses.

<sup>b</sup>In the case of France, the issue has not been addressed directly; the information in the table has been estimated on the basis of the answers to other questions.

<sup>c</sup>Weighted average (GDP weights).

<sup>d</sup>As an indicator of the degree of competition, we use the degree of perceived competition defined as the importance firms attribute to competitors' prices in influencing a reduction in their own prices (unimportant, of minor importance, important, very important).

rules and 11 percent follow purely state-dependent ones). In the euro area, around two-thirds of the companies apply pricing strategies with some element of state dependence. Among these firms, those adopting a mixed strategy are predominant, except in four countries (ES, LU, NL, and PT).

*Stylized Fact 1: Both time- and state-dependent pricing strategies are used by euro-area firms. Around one-third of the companies follow mainly time-dependent rules, while the remaining two-thirds adopt pricing rules with some element of state dependence.*

### 3.2 Information Set Used in Price Reviews

The so-called New Keynesian Phillips curve (NKPC) models, which emphasize rational expectations and hence the existence of forward-looking price setters, are increasingly used for monetary policy analysis (see, for instance, Woodford 2003). Despite their theoretical success, however, these models generally fail to generate the sluggishness in price behavior that is empirically observed. Conversely, hybrid versions of the NKPC have been reported to provide a better representation of the observed price movements. In particular, price stickiness may stem from firms using some form of rule of thumb in setting their price (Galí and Gertler 1999; Galí, Gertler, and López-Salido 2001), from indexation schemes (Christiano, Eichenbaum, and Evans 2005), or from stickiness in gathering information (Mankiw and Reis 2002). In all these cases, deviations from fully optimizing behavior generate an additional source of sluggishness in the response of inflation to shocks. The information set used by companies when making their pricing decisions has, indeed, important implications for the speed of price adjustment in response to a broad range of disturbances.

Six national surveys (BE, ES, IT, LU, AT, and PT) provide data on the information set on which firms base their decisions when they review their prices. This is an important piece of evidence that reflects different degrees of optimality of price-setting strategies. Companies applying rules of thumb (for instance, changing prices by a fixed percentage, or following a CPI indexation rule) may end up charging a price that deviates substantially from the optimal one if a large shock occurs. In this sense, these companies behave nonoptimally. At the other extreme, price reviews are

**Table 2. Information Set Used by Firms for Pricing Decisions (*Percentages*)<sup>a</sup>**

	BE	ES	IT	LU	PT	AT	Euro Area <sup>b</sup>
Rule of Thumb	37	33	n.a.	30	25	n.a.	
Past/Present Context	29	39	32	26	33	37	<b>34</b>
Present/Future Context	34	28	68	44	42	12	<b>48</b>
Past, Present, and Future	n.a.	n.a.	n.a.	n.a.	n.a.	51	
<sup>a</sup> Rescaled figures excluding nonresponses.							
<sup>b</sup> Weighted average (GDP weights). Note that the percentages for the euro area do not add up to 100, as different answer categories were used in the various countries.							

addressed in an optimal way if companies use a wide set of indicators relevant for profit maximization, including expectations about the future economic environment.

On average, 48 percent of the firms in the euro area evaluate their prices on the basis of an information set that includes expectations about future economic conditions (table 2). There are some differences across countries in the share of forward-looking firms, which ranges from 28 percent in Spain to 68 percent in Italy.

A large fraction of firms, however, do not behave optimally, either due to backward-looking behavior or to the use of rules of thumb. About one-third of the firms take only historical data into account. For those surveys that included the rule-of-thumb option (such as indexation based on the consumer price index, a fixed percentage adaptation, etc.), the results indicate that this pricing method is adopted by 37 percent of firms in Belgium, 33 percent in Spain, 30 percent in Luxembourg, and 25 percent in Portugal.

Overall, the pattern of results reported in this section lends support to the recent wave of estimations of hybrid versions of the New Keynesian Phillips curve.

Information available for Spain and Luxembourg shows that smaller firms tend to be more backward looking than larger ones and, conversely, larger firms tend to attach more importance than

smaller ones to expectations about future conditions when assessing their prices.

*Stylized Fact 2: Around half of the firms review their prices taking into account a wide range of information, including both past and expected economic developments; one-third of them show a backward-looking behavior.*

### 3.3 Frequency of Price Reviews

All national surveys contain a question about how often firms that follow time-dependent rules assess their prices. Typically, the respondents were given a choice among several categories (daily, weekly, monthly, quarterly, etc.).<sup>4</sup> Belgium, Luxembourg, and Spain opted for a slightly different formulation, asking whether the respondents review their prices more than once a year, once a year, or less than once a year; within these categories, respondents had to specify the number of times.<sup>5</sup>

Table 3 groups the results into three classes: the share of respondents that review their price (i) a maximum of three times a year, (ii) between four and eleven times a year, and (iii) at least twelve times a year. In all countries, the largest share of firms fall into the first category (57 percent for the euro area as a whole).

With respect to the median frequency of price reviews, countries can be classified into three groups: (i) in Belgium, Spain, and Italy, the median firm checks its price once a year, (ii) in France, the Netherlands, and Austria, reviews are carried out on a quarterly basis, and (iii) in Germany, Luxembourg, and Portugal, the frequency of price reviews falls somewhere between that of groups (i) and (ii).

In order to find regularities in the price-reviewing pattern in the euro area, we investigate whether firms' size, sector, and

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<sup>4</sup>All those firms indicating that they carry out periodic price reviews and those applying time-dependent pricing rules in normal circumstances (and state-dependent ones in exceptional circumstances) were asked at what intervals they review their prices.

<sup>5</sup>As table 3 shows, Belgium and Spain report significantly higher shares (nearly 90 percent) of respondents indicating that they review their prices at most three times a year. This result suggests that the format of the answer categories might be relevant.

**Table 3. Frequency of Price Reviews per Year**  
*(Percentages)*<sup>a</sup>

	BE	DE	ES	FR	IT	LU	NL	AT	PT	Euro Area <sup>b</sup>
≥ 12	4	30	7	31	28	26	37	29	5	<b>26</b>
4–11	8	17	7	22	14	20	19	25	26	<b>17</b>
≤ 3	88	53	86	47	57	54	44	46	69	<b>57</b>
Median <sup>c</sup>	1	3	1	4	1	2	4	4	2	
<sup>a</sup> Rescaled figures excluding nonresponses. <sup>b</sup> Weighted average (GDP weights). <sup>c</sup> Median frequency of price reviews per year.										

competitive environment have an effect on firms' behavior. We apply a Chi-square test to examine whether the distribution of frequencies is equal for each of the aforementioned characteristics. Firm size explains differences in Spain, France, Luxembourg, the Netherlands, and Austria. In all these countries except France, large firms review their prices more frequently than smaller ones. Similarly, Amirault, Kwan, and Wilkinson (2004) find that large firms change prices significantly more often than small or medium-sized firms. They argue that senior staff members at small firms have numerous tasks in addition to reviewing and adjusting prices and, consequently, managerial costs associated with the price-setting process might be particularly onerous for small firms.<sup>6</sup>

With regard to the degree of competition, firms facing higher competitive pressures review their prices more frequently. In seven out of the nine countries, firms indicating that competitors' prices have a very important effect on their own pricing decisions review their prices more often than other firms. The exceptions are Austria and Belgium, where the competitive environment does not give rise to any difference.

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<sup>6</sup>They do not distinguish between the frequency of price reviews and the frequency of price changes, and their argument probably has more to do with the price-reviewing stage.

Finally, there are some interesting differences across sectors. The Chi-square test rejects the null hypothesis of equality across sectors in all seven countries for which this analysis is possible (in Germany and France, services are not covered) at the 10 percent significance level. In five countries (IT, LU, NL, AT, and PT), firms in the services sector review their prices significantly less frequently than firms operating in other sectors. Albeit not statistically significant, this tendency can also be observed in Belgium and Spain. In Spain, Luxembourg, and the Netherlands, firms in the trade sector carry out price reviews significantly more often than those in manufacturing and services. This is not the case for the other two countries that report results for trade (BE and IT).

*Stylized Fact 3: In most countries the modal number of price reviews lies in the range of one to three times a year. Firms in the services sector review prices less frequently than firms in the other sectors. Firms facing high competitive pressures carry out price reviews more frequently.*

There may be different reasons for the finding that price reviews happen with a relatively low frequency. On the one hand, the frequency could be related to the (potentially sporadic) arrival of information. In other words, it may not make sense for firms to review their prices more often, as no additional information is available.<sup>7</sup> On the other hand, there may be costs associated with price reviews. In the presence of informational costs, it may be optimal for firms to forego obtaining the most topical information instead of incurring the associated costs (see section 4.4).

#### 4. Price Changes

This section focuses on the various aspects related to the implementation stage of the price-adjustment process, by documenting the frequency of actual price changes and the empirical support of alternative theories of price stickiness.

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<sup>7</sup>Kashyap (1995) rejects this hypothesis. He observes different reviewing behavior also for products having similar cost and demand characteristics. However, if products are alike, then the arrival of the necessary information should also be correlated.

## 4.1 *How Do Firms Set Prices?*

### 4.1.1 *Markup Pricing as a Dominant Strategy*

A standard result in imperfectly competitive models is that, under quite general conditions, firms choose to charge a price that represents a markup over marginal cost and, therefore, have some room for not adjusting it when facing a variation in costs.<sup>8</sup> On the contrary, in the case of perfect competition, all firms belonging to the same market set their prices at a unique market-clearing level; there is no markup, and prices always equal marginal costs. Thus, price rigidities do not arise.

All questionnaires address the issue of how companies set their prices. In some cases (BE, ES, LU, NL, AT, and PT), firms were first asked to indicate whether they have an independent price-setting policy or whether their price is either regulated or set by the main company of the same group or dictated by the main customer. Firms with an independent policy were then asked to specify whether their price is set as a margin (markup) on costs, whether it depends on the price of their main competitor(s), or whether it is set according to other strategies. In the remaining countries, firms were directly requested to indicate their price-setting rule, choosing from among the above-mentioned options.

The option that the price is set as a margin applied to costs requires some clarification. First, whereas the theoretical literature refers to the concepts of markup and marginal costs, most businesspeople might not easily understand this terminology. In order to avoid confusion on the side of the respondents, the concept of markup has typically been translated into “profit margin,” while the concept of marginal costs has been translated into a number of different expressions, which might slightly differ across the various questionnaires: “unit variable costs” (cost of labor and of other inputs); “(variable) unit costs”; “unit variable production costs”; and “variable production costs per unit.” Second, all country questionnaires explore whether markup pricing is applied in general terms, except

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<sup>8</sup>Within the models with imperfect competition, some assume time-varying markups, with important implications for business-cycle fluctuations. See sections 8 and 9 in Rotemberg and Woodford (1994) for an overview of different models with exogenously and endogenously determined time-varying markups.

in the cases of Belgium, Germany, and the Netherlands, where a distinction is made between constant and variable markup.

Table 4 summarizes the results by grouping the answers into three alternatives: “markup over costs,” “price set according to competitors’ prices,” and “other.” The results are in line with findings of similar studies for the United Kingdom and the United States. In the euro area, more than half of the firms fix their price as a markup (fixed or variable) over costs. At the two extremes we find Germany (73 percent) and France (40 percent). For those countries (Belgium, Germany, and the Netherlands) in which respondents could distinguish between constant and variable markup, the latter dominates.

Figure 1 shows a negative relationship between the share of firms following a markup rule and the degree of market competition. This finding, similar across countries, is consistent with the idea that in a highly competitive environment firms are essentially price takers and do not fix their prices as a markup over costs. It is, however, important to remark that the share of firms setting their price according to those of their main competitors is quite relevant (around 30 percent for the euro area as a whole), ranging from 38 percent in France to 13 percent in Portugal. Finally, for a minority of respondents, the price is set according to “other” rules. The share amounts to only 10 percent in Germany, while it rises to 26 percent in Italy, where it is particularly high in trade and services (49 percent and 40 percent, respectively), possibly due to the strict regulatory framework in such sectors.<sup>9</sup> The percentage of companies following “other” rules is also generally higher for large firms than it is for small ones.

*Stylized Fact 4: Markup (constant or variable) pricing is the dominant price-setting practice adopted by firms in the euro area. However, the prices of around 30 percent of the firms are shaped by competitors’ prices.*

#### 4.1.2 Price Discrimination

One of the main features characterizing the price-setting mechanism is the presence of some form of price discrimination aimed at

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<sup>9</sup>Trade and services are not included in the German survey. If goods only are considered, the share falls to 19 percent in Italy.

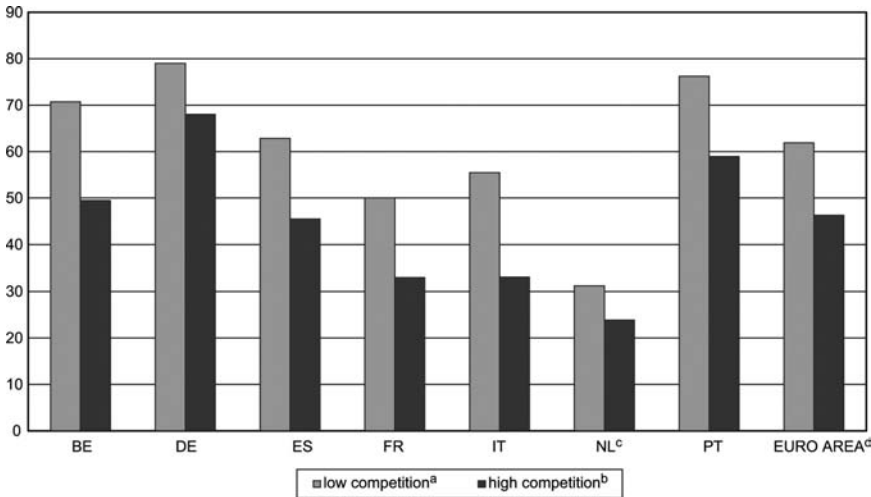


Table 4. Price-Setting Rules  
(Percentages)<sup>a</sup>

	BE		DE		ES	FR	IT	NL		PT <sup>c</sup>	Euro Area <sup>d</sup>
	<i>total</i>	<i>const. var.<sup>b</sup></i>	<i>total</i>	<i>const. var.</i>				<i>total</i>	<i>const. var.</i>		
<b>Markup</b>											
<i>Total</i>	46	13	—	—	52	—	42	56	27	65	54
goods	49	14	73	4	55	40	48	63	28	67	56
trade	41	11	—	—	50	—	16	71	37	—	37
services	49	18	—	—	50	—	43	45	19	48	46
<b>Competitors' Price</b>											
<i>Total</i>	36	—	—	—	27	—	32	22	—	13	27
goods	40	—	17	—	24	38	33	19	—	13	27
trade	33	—	—	—	26	—	35	21	—	—	30
services	39	—	—	—	31	—	18	24	—	8	24
<b>Other</b>											
<i>Total</i>	18	—	—	—	21	—	26	21	—	23	18
goods	11	—	10	—	22	22	19	18	—	19	17
trade	26	—	—	—	23	—	49	8	—	—	33
services	12	—	—	—	20	—	40	31	—	44	31

<sup>a</sup>Rescaled figures excluding nonresponses.  
<sup>b</sup>Firms adopting a markup rule and responding “important” or “very important” to at least one of the theories concerning countercyclical markups.  
<sup>c</sup>In the case of Portugal, the issue was not addressed directly; the information reported in the table has been estimated on the basis of the answers to other questions.  
<sup>d</sup>Weighted average (GDP weights).

**Figure 1. Markup and Perceived Competition**  
*(Percentages)*



<sup>a</sup>Mean share for a “very low” and “low” degree of perceived competition.

<sup>b</sup>Mean share for a “very high” and “high” degree of perceived competition.

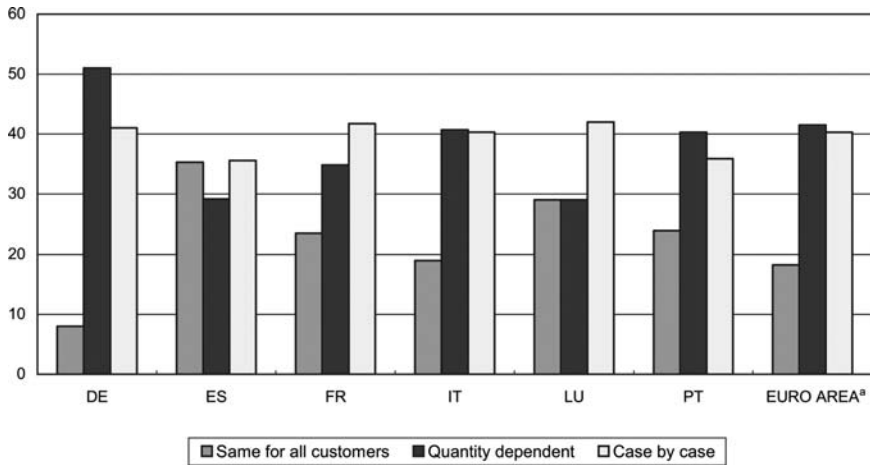
<sup>c</sup>For the Netherlands, the percentage of firms adopting a fixed markup is considered.

<sup>d</sup>Weighted average (GDP weights).

extracting a higher fraction of consumer surplus than the firm would be able to obtain if it charged a uniform price. Price discrimination may take many forms: the price of a product may vary according to the type of customer, the geographical area in which it is sold, the number of units purchased, or the specific time at which it is sold, to name but a few (see Tirole 1988, chap. 3).

The presence of some form of price discrimination is investigated in several of the national questionnaires. The findings presented in figure 2 strongly reject the use of a uniform pricing scheme as a general rule to describe the price-setting behavior of euro-area firms. In particular, the percentage of firms setting prices on a case-by-case basis or in accordance to the quantity of the product sold is, on average, around 80 percent in the euro area, ranging from 65 percent in Spain to 92 percent in Germany. In the other four countries (FR, IT, LU, and PT) the figure is around 75 percent.

**Figure 2. Price Discrimination  
(Percentages)**



<sup>a</sup>Weighted average (GDP weights).

*Stylized Fact 5: Price discrimination is common practice for euro-area firms.*

More significant differences are found across sectors, although on this point the data is limited to only a few countries. In particular, uniform pricing is, as expected, more common in the trade sector, where the share of companies charging the same prices to all customers is around 55 percent in Italy and Spain and 44 percent in Luxembourg. The corresponding figures for the overall samples in these countries are 19 percent, 35 percent, and 29 percent, respectively. At the other extreme, the share of companies setting their prices on a case-by-case basis or according to the quantity sold is highest in manufacturing, which may explain the high numbers for Germany (figure 2).

#### 4.1.3 Pricing to Market

The law of one price states that the price of a product must be the same across national markets. While the invoicing currency and hence exchange rate developments are certainly an issue in this context, the law of one price should even apply when adjusting for exchange rates. A substantial number of empirical studies, however,

reject the validity of this law in the short run. A common explanation of departures from the law of one price is that transaction (arbitrage) costs between different geographical markets are high enough that firms can discriminate their prices across countries. In other words, when national markets are segmented by transportation costs or other barriers, exporting firms are able to set a different price in each market. "Pricing to market" is the usual term in the international trade literature for price discrimination across national markets.<sup>10</sup>

Given the open-economy nature of most euro-area economies, the price-setting behavior of exporters is a relevant issue. The surveys conducted in Belgium, Spain, Luxembourg, and Portugal include some specific questions, directed at firms operating in more than one market, which may provide valuable insights.

The questionnaires for Belgium, Spain, and Luxembourg inquire whether the price charged in different countries is the same or not. It turns out that around 50 percent of the exporting firms apply some form of pricing to market. As Aucremanne and Druant (2005) point out, this is a high proportion given that the exports of the countries considered are mostly directed toward the euro area, where a common currency is used. Price discrimination is even more frequent in the case of firms selling outside the euro area. In the Spanish sample, 60 percent of these companies charge different prices across non-euro-area countries. In the case of Portugal, the question is put differently. It only involves those firms exporting to countries outside the euro area, which are asked what would happen to the local price of their product in the selected country if the euro appreciated by 5 percent. For about 60 percent of the firms, the price would either remain unchanged or increase by less than 5 percent.

The questionnaires in the four countries also include a question on the importance of several factors in explaining differentiated prices across markets. Table 5, which reports the average scores assigned to the different factors, shows that the ranking is very similar in all four countries. Competitors' prices and transportation costs are the most relevant determinants; cyclical fluctuations in demand rank immediately below. Exchange rate developments and structural market conditions have only a moderate importance.

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<sup>10</sup>See Obstfeld and Rogoff (1996) for a brief review of the empirical evidence on pricing to market.

**Table 5. Importance of Factors in Differentiated Price Setting across Markets**  
(*Mean Scores*)

	BE	ES	LU	PT
Price of Competitors	3.4	3.2	3.3	–
Transportation Costs and Other Factors	2.9	–	3.1	3.0
Cyclical Fluctuations in Demand	2.5	3.0	2.7	2.7
Structural Market Conditions	2.5	2.5	2.8	2.5
Exchange Rate of Payment Currency	2.4	2.2	1.8	2.5
Market Rules	2.1	–	2.7	2.8
Tax System	1.6	1.8	2.2	2.2

Not surprisingly, exchange rate movements receive a higher score from those firms exporting outside the euro area. Nevertheless, even for such firms, this factor is ranked below—at least in the Spanish sample—competitors’ prices and demand. Finally, the local market tax system is generally singled out as the least relevant factor for explaining price differences across countries. As Aucremanne and Druant (2005) indicate, this factor is more important in consumer-oriented firms, for which differences in indirect taxation are presumably more significant.

*Stylized Fact 6: Competitors’ prices on the foreign market and transportation costs are the most relevant factors for pricing-to-market behavior.*

#### 4.2 How Often Do Firms Change Their Prices?

A rough measure of the degree of price stickiness is given by the number of price changes per year or, alternatively, by the average time elapsed between two consecutive price changes. Although the average duration of price spells is an essential ingredient in the calibration of dynamic stochastic general equilibrium (DSGE) models, which are widely used for monetary policy analysis (see, for instance, Woodford 2003 and Galí, López-Salido, and Vallés

2003), its empirical assessment has until very recently mainly relied on macroeconomic evidence.<sup>11</sup> In recent years, the availability of large-scale data sets of individual producer and consumer prices has strongly contributed to improve the measurement of the duration of price spells (see, for instance, Álvarez et al. 2005 and Dhyne et al. 2005). In this respect, survey results are useful for cross-checking the evidence obtained from these quantitative databases.

All national surveys, except that for Germany, contain a question on the number of price changes per year.<sup>12</sup> In particular, five questionnaires (BE, ES, LU, NL, and AT) inquire about the average number of price changes per year in recent years, and three of them (IT, FR, and PT) inquire about the number of price changes in a given year. Table 6 groups the results into four categories: (i) at least four price changes per year, (ii) two or three price changes per year, (iii) one price change per year, and (iv) less than one price change per year.<sup>13</sup>

The country results are very homogenous with the exception of Germany, where, as previously remarked, a different data source was used to obtain this specific information. On average, almost 40 percent of the firms in the euro area change their price once a year (the percentage share rises to 51 percent if Germany is excluded from the computation of the mean). In all countries except Germany and Luxembourg, approximately 70 percent of the respondents adjust their price a maximum of once a year.<sup>14</sup> On average, only around 34 percent of the firms change their price more frequently than once

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<sup>11</sup>Smets and Wouters (2003) and Rabanal and Rubio-Ramírez (2005) are two recent examples of papers providing estimates of the average duration of prices.

<sup>12</sup>Since the German questionnaire does not contain a question on the number of price changes, the figures in table 6 concerning Germany are based on the number of months with price changes in 2003, reported by the same sample of firms as in the IFO business survey. The figures are quite different from those obtained for the rest of the countries, probably on account of the particularly low demand faced by German firms in that year.

<sup>13</sup>The categories are not the same as those used in table 3, since the number of price changes in most countries is considerably lower than that of price reviews.

<sup>14</sup>In Luxembourg this is largely due to the inclusion of the construction sector and its relative share in the responses (22 percent). Excluding this sector, as in the case of most other countries, would also result in a median of one price change per year.

**Table 6. Frequency of Price Changes per Year  
(Percentages)<sup>a</sup>**

	BE	DE	ES	FR	IT	LU	NL	AT	PT	Euro Area <sup>b</sup>
$\geq 4$	8	21	14	9	11	27	11	11	12	<b>14</b>
2–3	18	21	15	24	19	27	19	15	14	<b>20</b>
1	55	14	57	46	50	31	60	51	51	<b>39</b>
$< 1$	18	44	14	21	20	15	10	24	24	<b>27</b>
Median <sup>c</sup>	1	1	1	1	1	2	1	1	1	

<sup>a</sup>Rescaled figures excluding nonresponses.  
<sup>b</sup>Weighted average (GDP weights).  
<sup>c</sup>Median frequency of price changes per year.

a year. In all but one country, the median firm changes its price once a year.

These results are consistent with the frequency of producer price changes documented by Álvarez et al. (2005), on the basis of micro-PPI data for six euro-area countries. According to their findings, about 20 percent of individual producer prices are changed in a given month, which translates into a frequency of price change of about once a year. The survey results are also broadly in line with the evidence presented in Dhyne et al. (2005) who, on the basis of large-scale data sets of individual consumer price data for euro-area countries, find that the average duration of a price spell, based on a set of indirect estimators, ranges from four to five quarters.

With respect to comparable studies for non-euro-area countries, our results are in line with the findings of Apel, Friberg, and Hallsten (2005) for Sweden, where the modal number of actual price changes per year lies at the yearly frequency. However, the frequency estimated for euro-area firms is lower than that reported by Blinder et al. (1998) for the United States; Hall, Walsh, and Yates (1997) for the United Kingdom; and Amirault, Kwan, and Wilkinson (2004) for Canada (1.4, 2, and 4 price changes per year, respectively). The finding of a lower frequency of price adjustment in the euro area compared to the United States is consistent with the empirical evidence stemming from the analysis of microquantitative data (see

Dhyne et al. 2005) and from macro models (see Galí, Gertler, and López-Salido 2003).

As in the case of price reviews, the degree of competition faced by firms and the sector of activity help to explain differences in the frequency of price changes. With the exception of Austria and Portugal, in all the countries, firms that are subject to strong competitive pressures tend to change their prices significantly more often than those that do not face such pressures. In all the countries where the survey covers more than one sector, the Chi-square test for the equality of the distribution of price-change frequencies across sectors rejects the null hypothesis at the 5 percent level, pointing to significant differences. In five countries (BE, IT, LU, AT, and PT), firms in the services sector change their prices less frequently than those in other sectors; in four countries (ES, IT, LU, and NL), the frequency of price change is highest in the trade sector.

*Stylized Fact 7: The median firm changes its price once a year. Prices are stickier in the services sector and more flexible in the trade sector. In most countries, firms facing strong competitive pressures adjust their prices more frequently.*

#### 4.3 *The Relationship between Price Reviews and Price Changes*

Taking into account only the companies that provided information concerning the frequency of price reviews and of price changes, all countries report that the former are conducted more frequently than the latter. Even with the categorized data used, at the euro-area level the share of firms changing their prices less than quarterly (maximum three times per year) is 86 percent, compared to 57 percent of firms reviewing their prices with the same frequency (table 7). Similar evidence is found in all but two countries.<sup>15</sup>

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<sup>15</sup>In both Belgium and Spain, the frequency of price reviews is only slightly higher than that of price changes. As already mentioned, this might be partly explained by the format of the answer categories. In these two countries, firms are asked whether they review/change their prices more than once a year, once a year, or less than once a year. A substantial fraction of firms indicate that they review/change their prices once a year. If these questions had been formulated allowing for more answer categories, the fraction of firms declaring a yearly frequency of reviews/changes would have been lower.



**Table 7. Comparison between Price Reviews  
and Price Changes per Year  
(Percentages)<sup>a</sup>**

	BE	DE	ES	FR	IT	LU	NL	AT	PT	Euro Area <sup>b</sup>
Price Reviews $\leq 3$	88	53	86	47	57	54	44	46	72	<b>57</b>
Price Changes $\leq 3$	91	79	88	91	89	73	89	90	88	<b>86</b>
<sup>a</sup> Rescaled figures excluding nonresponses. <sup>b</sup> Weighted average (GDP weights).										

*Stylized Fact 8: Price changes are less frequent than price reviews.*

This finding stands in contrast to the assumption underlying the sticky-information model by Mankiw and Reis (2002), according to which prices are always changing, but price reviews are less frequent due to costly information or costs of reoptimization. The firms that cannot reoptimize their price in a given period simply follow old plans and outdated information to set prices. The finding also contradicts the assumption of lagged inflation indexation, which is assumed to be the price-setting rule of those firms that cannot reoptimize their price in a given period in Christiano, Eichenbaum, and Evans (2005), and which also implies that prices are always changing.

All in all, the evidence provided in this section is consistent with the notion that price adjustment takes place at two stages. First, the firms review their prices to check whether they are at the optimal level or need to be changed. As shown in section 3.3, they do this at discrete time intervals (the majority less than four times per year). Thus, some kind of stickiness can already be observed at the first stage of price setting. Once the review has taken place, firms may change their prices. However, they do so with a lower frequency than that of price reviews. One explanation of why prices are left unchanged may be that there is no reason to change them.<sup>16</sup> Alternatively, even though firms decided to incur the informational costs

<sup>16</sup> Although almost all national surveys address the issue of price reviews and price changes while referring to “normal conditions,” in most cases it is not possible to control for the fact that the observed price behavior is in fact related to the occurrence of particular shocks, either of an idiosyncratic nature or of a common one.

of the price review, there may be other factors effectively preventing a desired price adjustment. Such factors are addressed in the next section.

#### *4.4 Why Do Firms Hold Prices Constant?*

The economic literature provides manifold explanations for sticky prices. As Blinder (1991) points out, however, it is difficult to evaluate how close the various theories come to the obstacles to changing prices encountered in the real world (one problem being observational equivalence). Thus, Blinder applied the interview method as a new way of examining the empirical relevance of different theories. He explained selected theories in face-to-face interviews with managers and assumed that they would recognize the line of reasoning if it came close to their way of thinking. All the national surveys on which this paper is based apply a similar method, presenting managers with different theories chosen according to their relevance in the economic literature, as well as their rankings in the surveys already conducted for other countries (Apel, Friberg, and Hallsten 2005; Blinder et al. 1998; Hall, Walsh, and Yates 1997). Before turning to the results, we summarize the most relevant theories.

**Cost-Based Pricing.** Inputs' costs are an important determinant in a firm's pricing decision. One line of reasoning based on this argument is that if costs do not change, prices will not change either. As products pass different production stages, a (demand or cost) shock somewhere in the production chain will take some time until it is propagated through the chain to finally reach consumers. Blanchard (1983) models production chains with  $n$  stages and assumes adjustment lags at each level of production. Even small lags in the adjustment process of a single firm can add up to long lags when taking into account the whole production chain.

**Explicit Contracts.** Firms have contractual arrangements with their customers, which may be in written form or orally agreed upon and in which they guarantee to offer a certain product at a specific price. An explanation of why firms engage in such agreements is that it is in their interest to build long-run customer relationships in order to stabilize their future sales. Customers, on the other hand, are attracted by a constant price because it makes their future costs more predictable and helps to minimize transaction costs (e.g.,

shopping time). Thus, customers might focus on the long-run average price rather than on the spot price. This is probably the most straightforward explanation of sticky prices. The idea that explicit contracts may be central for price stickiness was first introduced in the economic literature through wage contracts (e.g., Fischer 1977).

**Implicit Contracts.** This explanation is closely linked to the explicit contract theory but goes one step further. With implicit contracts, firms also want to build long-run customer relationships, and they try to win customer loyalty simply by changing prices as little as possible. This idea goes back to Okun (1981), who distinguishes between price increases due to cost shocks and those due to demand shocks. He argues that higher costs are an accepted rationale for rising prices, while increases in demand are viewed as unfair. Consequently, firms hold prices constant in the face of demand shocks, as they do not want to jeopardize customer relationships. They only adjust prices in response to cost shocks. The idea that consumers wish to buy from firms whose prices are “fair” is also applied by Rotemberg (2005).

**Coordination Failure.** This theory focuses on the interactions between firms as explanation for sticky prices. As in the case of explicit contracts, this idea was first introduced for the analysis of the labor market (e.g., Clower 1965; Leijonhufvud 1968). The argument is that the firm assumes that if it were to raise its price, it would lose customers, as no other firm would follow suit. On the other hand, if the firm were to decrease its price, it would not increase its market share, as all competitors would follow suit. After a shock a firm might, thus, want to change its price, but only if the other firms do the same. Without a coordinating mechanism that allows firms to move together, prices may remain fixed.

**Menu Costs.** Sheshinski and Weiss (1977) motivate the idea that the act of changing prices—printing and distributing new price lists—generates costs. Thus, a company facing these costs will change its prices less frequently than an otherwise identical firm without such costs. Akerlof and Yellen (1985) and Mankiw (1985) show that even “small” costs of changing prices can lead to nominal rigidities with “large” macroeconomic effects. In order to distinguish between different kinds of costs associated with price changes, we will use the term “menu cost” in a narrow sense and focus on the physical cost of changing prices.

**Costly Information.** Ball and Mankiw (1994) suggest a broader use of the term “menu costs,” in the sense that it includes more than just the physical costs of changing prices. In particular, they argue that “the most important costs of price adjustment are the time and attention required of managers to gather the relevant information and to make and implement decisions” (p. 142). The distinction between these informational costs and physical menu costs enables us to investigate their relative importance in pricing decisions.

**Temporary Shocks.** When firms regard the shock they face as temporary, they may consider it appropriate to forego a price adjustment, as they expect the optimal new price to be short lived as well. It is not relevant whether the shock is indeed temporary or not, the main issue being how the firms assess the duration of the shock.

**Change in Nonprice Factors.** The price of a product is just one feature that can be adjusted in reaction to a changing environment. Firms can vary the delivery time, modify the quality of the product, or alter the level of service they offer in relation to the sale, to name but a few of the options that they have.

**Judging Quality by Price.** This line of reasoning reverses the argument used in the theory above addressing the issue of nonprice factors. The argument is that firms do not decrease the price of their product because customers might wrongly interpret the price decrease as a reduction in quality. Thus, they prefer to hold their nominal prices constant.

**Pricing Thresholds.** Firms may set their prices at psychologically attractive thresholds—for example, choosing €9.90 instead of €10.00. Attractive pricing strategies can cause price stickiness, because firms may postpone price adjustments in the face of small shocks, calling for small price changes until new events justify a large price change to the next pricing threshold.

All the national questionnaires asked the managers a question along the following lines: If there are reasons for changing the price of your main product, which of the following factors may well prevent an immediate price adjustment? The list following this question offered the above-mentioned theories, expressed in simple terms, as possible explanations. The respondents could indicate their degree of agreement with each theory, choosing from among four

categories: unimportant (1), of minor importance (2), important (3), and very important (4), where the numbers in parentheses indicate the scores attached to each category.<sup>17</sup> Columns 1 to 9 in table 8 present the mean scores assigned by the firms in each country to the various theories. Column 10 reports the average of the country results, which is taken as an indication of the overall ranking for the euro area. Based on this ranking, two groups can be distinguished: the first group consists of those theories that have an average score well above 2, while the second group comprises the remaining theories. The last four columns of the table show the ranking of the same theories in the surveys by Blinder et al. (1998) for the United States; Apel, Friberg, and Hallsten (2005) for Sweden; Hall, Walsh, and Yates (1997) for the United Kingdom; and Amirault, Kwan, and Wilkinson (2004) for Canada.

The theory of “implicit contracts” receives the highest average score (2.7) and ranks first in five country studies. With an average score of 2.6, “explicit contracts” is the second most important explanation for sticky prices at the euro-area level (it ranks most important in four countries). The same average score is attributed to “cost-based pricing.” Finally, with an average score of 2.4, “coordination failure” can also be regarded as a relevant factor behind price stickiness.

Implicit and explicit contracts are both based on the idea that firms want to establish long-run relationships with customers in order to make future sales more predictable. Their high score is consistent with the evidence presented in table 9, which shows that long-term relationships with customers are indeed a widespread phenomenon in the euro area. In this respect, Okun (1981) argues that price increases that are due to cost increases are viewed as fair by customers, while price increases that are due to a tight market are regarded as unfair. If this is the case—and the results suggest that managers indeed share this perception—it would be more likely that firms increase their prices in response to cost shocks than to demand shocks.

The theories ranked third and fourth are consistent with the price-setting strategies indicated by firms as the most common ones.

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<sup>17</sup>In the Dutch questionnaire the scaling is more detailed (from 1 to 10). Results have been rescaled for comparability.

Table 8. The Importance of Theories Explaining Price Stickiness  
(Mean Scores)

	(1) BE	(2) DE	(3) ES	(4) FR	(5) IT	(6) LU	(7) NL	(8) AT	(9) PT	(10) Euro Area <sup>a</sup>	(11) US	(12) SW	(13) UK	(14) CA <sup>b</sup>
Implicit Contracts	2.5	–	2.6	2.2	–	2.7	2.7	3.0	3.1	<b>2.7</b>	4	1	5	2/7
Explicit Contracts	2.4	2.4	2.3	2.7	2.6	2.8	2.5	3.0	2.6	<b>2.6</b>	5	3	1	3
Cost-Based Pricing	2.4	–	–	2.5	–	2.7	–	2.6	2.7	<b>2.6</b>	2	2	2	1
Coordination Failure	2.2	2.2	2.4	3.0	2.6	2.1	2.2	2.3	2.8	<b>2.4</b>	1	4	3	5/8
Judging Quality by Price	1.9	–	1.8	–	–	2.2	2.4	1.9	2.3	<b>2.1</b>	12	–	10	–
Temporary Shocks	1.8	1.9	1.8	2.1	2.0	1.7	2.4	1.5	2.5	<b>2.0</b>	–	–	–	–
Nonprice Factors	1.7	–	1.3	–	–	1.9	1.9	1.7	–	<b>1.7</b>	3	–	8	4
Menu Costs	1.5	1.4	1.4	1.4	1.6	1.8	1.7	1.5	1.9	<b>1.6</b>	6	11	11	10
Costly Information	1.6	–	1.3	–	–	1.8	–	1.6	1.7	<b>1.6</b>	–	13	–	10
Pricing Thresholds	1.7	–	1.5	1.6	1.4	1.8	1.8	1.3	1.8	<b>1.6</b>	8	7	4	–

<sup>a</sup>Unweighted average of countries' scores. Columns 11 to 14 report the ranking of the theories in Blinder et al. (1998), Apel, Friberg, and Hallsten (2005), Hall, Walsh, and Yates (1997), and Amirault, Kwan, and Wilkinson (2004), respectively.  
<sup>b</sup>In the column for Canada, two figures are reported for the implicit contracts and coordination failure theories, because in the Canadian questionnaire there are two different statements related to these theories.

**Table 9. Firms' Relationships with Customers**  
*(Percentages)*<sup>a</sup>

	BE	DE	ES	FR	IT	LU	NL	AT	PT	Euro Area <sup>b</sup>
Long Term	78	57	86	54	98	85	–	81	83	<b>70</b>
Occasional	22	43	14	46	2	15	–	19	17	<b>30</b>
<sup>a</sup> Rescaled figures excluding nonresponses. In the case of Belgium, France, and Italy, figures refer to relationships with other firms. <sup>b</sup> Weighted average (GDP weights).										

Cost-based pricing, which scores third, confirms the finding, reported in section 4.1.1, that the majority of firms set their price as a markup over costs. In this light, relatively stable costs and/or the sluggishness of the price response to cost changes are an important reason underlying price stickiness. The theory ranked fourth—coordination failure—relates instead to the interaction between firms on the same market. As shown in section 4.1.1, nearly 30 percent of the firms follow their competitors' prices when they set their own prices. Together with the fear of a lack in coordinating price movements, this provides a further explanation for price inertia—namely, that firms prefer not to change their prices as long as none of their competitors move first.

Each of the top four theories also ranks either first or second in the studies available for non-euro-area countries (Blinder et al. 1998; Apel, Friberg, and Hallsten 2005; Hall, Walsh, and Yates 1997; and Amirault, Kwan, and Wilkinson 2004). Moreover, the fact that the surveys for the euro area were conducted in different ways confirms that the findings do not depend on the survey method, on the particular wording used, or on the ordering of the answer categories.<sup>18</sup>

<sup>18</sup>The ordering of the theories differs considerably across the various questionnaires. For example, in the Dutch questionnaire, the theory of implicit contracts is the second answer category, while it appears in ninth place in the Austrian questionnaire. Nevertheless, in both country studies, the theory is regarded as the most important explanation. Overall, we do not find an association between the ordering of the answer categories and the scores given to the theories by respondents.

The importance attached to the various causes of price rigidity differs only slightly across sectors. In particular, in manufacturing and services the ranking is very similar to the one presented in table 8. There are small differences in the trade sector, in which explicit contracts are relatively less important, while, as expected, pricing thresholds are recognized as being slightly more relevant.

The remaining theories are, on average, not considered as important obstacles to price adjustment by euro-area firms. This group includes prominent candidates such as physical menu costs and costly information. Although they are frequently used explanations for price stickiness in the theoretical literature (e.g., Ball and Mankiw 1994), in practice they seem to be of minor importance for price setters.

The ranking attached to the various theories also provides some evidence on whether the factors preventing price adjustment have a greater bearing on the first or the second stage of the process itself, as discussed in section 3.3. In this respect, the evidence suggests that, for the majority of the firms, the main obstacles are not associated with the review stage but rather with the price change stage. In fact, the theory labeled “information costs”—i.e., costs associated with gathering and processing information for pricing decisions (stage 1 of price adjustment)—receives one of the lowest scores in all the surveys that included this category. A similar result is reported by Apel, Friberg, and Hallsten (2005) and Amirault, Kwan, and Wilkinson (2004).

*Stylized Fact 9: Implicit and explicit contracts are the most relevant explanations for sticky prices, suggesting that price rigidities are associated with customers' preference for stable nominal prices. Other relevant factors rest on cost-based pricing and coordination failure. These results indicate that the main impediments to more-frequent price adjustment are associated with the price-change stage rather than with the price-review stage of the price-setting process.*

Overall, these findings are in line with the results of Zbaracki et al. (2004), who report quantitative estimates of the different costs of price adjustments. They differentiate between costs of producing and distributing price sheets (what we call menu costs), managerial costs (information costs in our terminology), and customer costs. They conclude that while approximately one-quarter of the overall



costs of changing prices are due to menu costs and information costs, three-quarters arise because customers dislike price changes.

## 5. Factors Driving Price Changes

### 5.1 *Asymmetries of Price Reactions*

The empirical literature provides evidence that price increases and price decreases do not occur with the same (conditional) probability. Dhyne et al. (2005) show that, for the euro area, price reductions are moderately less frequent than price increases: four out of ten price changes are decreases.<sup>19</sup> Analogous results are obtained by Lünnemann and Mathä (2005) using price index data. Asymmetries are also found with respect to the size of price changes, as average price increases tend to be smaller than average price decreases. The results for the United States are quite similar: Klenow and Kryvtsov (2004) report that 45 percent of all price changes are price reductions.

In order to analyze what drives price changes and whether there are asymmetries depending on the direction of the price adjustment, all national surveys included questions about factors underlying pricing decisions. Respondents were asked to assign scores between 1 (completely unimportant) and 4 (very important) to cost factors (labor costs, raw material costs, and financial costs) and market conditions (demand and competitors' prices) according to their importance in driving price adjustment. The question was posed separately for price increases and decreases.

The results are presented in table 10, which contains the mean scores for every factor in each country as well as the euro-area average score in the last column. The table shows that costs of raw material and labor costs are the most important factors driving prices upward. They receive an average score of 3.0 and rank first and second in every country. As for price decreases, competitors' prices (with an average score of 2.8) are the most widely recognized cause for downward price movements, followed by changes in demand

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<sup>19</sup>Some country surveys (FR, NL, and PT) investigate the share of price increases and decreases, which turn out to be around 70 percent and 30 percent, respectively.

Table 10. The Importance of Different Factors Driving Price Changes  
(Mean Scores)

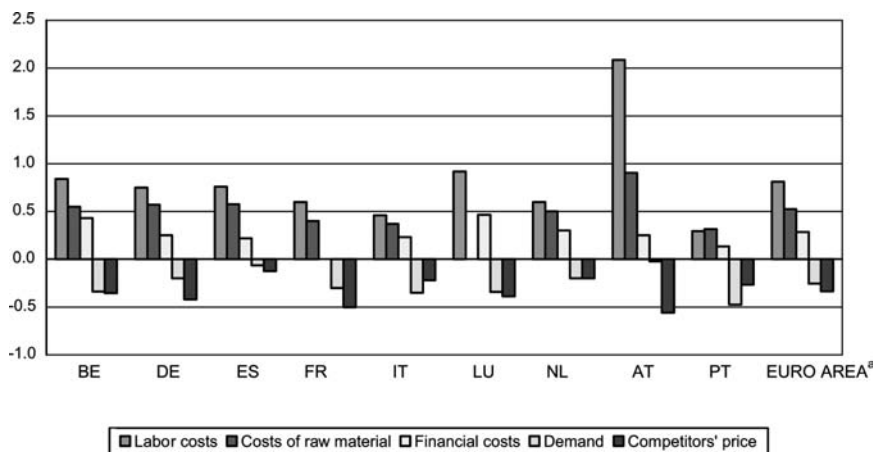
A. Price Increases										
	BE	DE	ES	FR	IT	LU	NL	AT	PT	Euro Area <sup>a</sup>
Labor Costs	2.9	2.7	2.7	2.5	2.9	3.5	2.7	3.4	3.3	3.0
Costs of Raw Materials	2.9	3.4	3.1	3.0	3.3	–	2.5	3.1	3.6	3.1
Financial Costs	2.2	1.9	1.8	–	2.3	3.0	2.1	1.9	2.5	2.2
Demand	2.2	2.2	2.4	2.0	2.4	2.3	2.3	1.9	2.5	2.2
Competitors' Price	2.5	2.1	2.5	2.3	2.6	2.4	2.5	2.0	2.7	2.4
B. Price Decreases										
Labor Costs	2.1	1.9	2.0	1.9	2.4	2.6	2.1	1.3	3.0	2.1
Costs of Raw Materials	2.3	2.8	2.6	2.6	2.9	–	2.0	2.2	3.3	2.6
Financial Costs	1.8	1.6	1.5	–	2.1	2.5	1.8	1.6	2.3	1.9
Demand	2.5	2.4	2.4	2.3	2.8	2.7	2.5	2.0	3.0	2.5
Competitors' Price	2.9	2.6	2.7	2.8	2.8	2.8	2.7	2.6	2.9	2.8
<sup>a</sup> Unweighted average of countries' scores.										

conditions and costs of raw material. Financial costs do not seem to be relevant. These results hold for all sectors and are not sensitive to differences in the firms' size. The much-higher score received by cost changes in driving prices upward than downward could, in principle, be related to the fact that costs normally tend to increase. However, while this is likely to be the case for "wages," it does not hold necessarily for raw material prices, which exhibit a rather volatile pattern, mirroring movements in world demand and exchange rates.

To conclude, at the euro-area level, firms are more prompted to change their prices in response to shocks that lead to profit losses (rising costs of raw material and labor as well as a decrease in competitors' prices) than to shocks leading to profit gains (decreasing labor and financial costs as well as improving demand conditions and an increase in competitors' prices). Note that the results on the factors driving price movements do not seem to be sensitive to the economic outlook prevailing at the time the national surveys were conducted.

In order to present an even clearer picture on the asymmetries in the reasons underlying price increases and decreases, figure 3

**Figure 3. Asymmetries in Price-Driving Factors**  
(*Difference between Scores Regarding Price Rises and Price Decreases*)



<sup>a</sup>Unweighted average of countries' scores.

shows the difference of the reported scores for each factor. The results reveal a strikingly regular pattern of positive asymmetries for costs and negative asymmetries for market conditions.

*Stylized Fact 10: Cost shocks are more relevant in driving prices upward than downward, while shocks to market conditions (changes in demand and competitors' prices) matter more for price decreases than increases.*

Our findings about cost shocks are in line with the conclusions from Peltzman (2000), who provides evidence that, on average, prices respond faster to input price increases than to decreases and that the immediate response after a positive cost shock is at least twice the response to a negative one. The importance of implicit contracts as a cause of price stickiness, revealed in section 4.4, may provide a rationale for this asymmetry. If, as argued by Okun's "customer market" theory, customers view price increases due to cost increases as fair and price increases due to increased demand as unfair, firms should be more likely to increase their prices in response to cost shocks than to demand shocks, as they try to avoid jeopardizing customer relationships.

While Peltzman (2000) only focuses on the asymmetry with regard to cost shocks, we additionally find that demand shocks also affect prices asymmetrically. Negative demand changes are more likely to induce price adjustments than positive ones. Interpreting monetary policy shocks as demand shocks, we can compare our results with the discussion in the literature. Two classes of models can be identified, both implying asymmetric effects of money on output,<sup>20</sup> but with different implications about how nominal shocks affect prices. The first, based on the assumption of a convex aggregate supply curve (e.g., Ball and Romer 1989, 1990; Caballero and Engel 1992; Tsiddon 1993), imply that positive money-supply shocks have a larger effect on prices than negative ones. Conversely, the second class of models argue that positive money-supply shocks have a smaller effect on prices than negative ones. De Long and Summers

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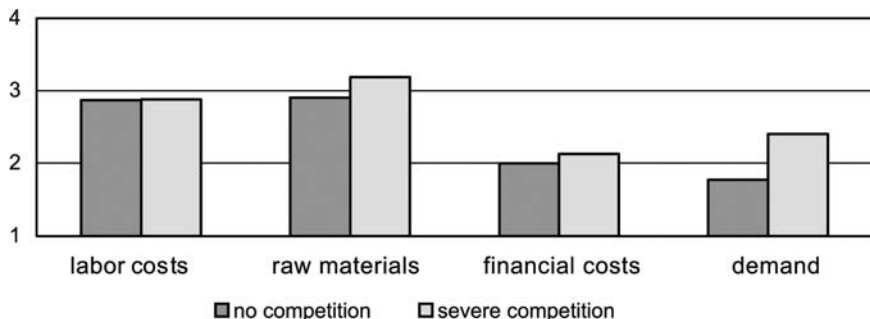
<sup>20</sup>Cover (1992) concludes that positive shocks in the money supply have no significant effect on output, whereas negative shocks reduce output. These results about the asymmetry of monetary policy shocks with regard to the sign of the shocks are also confirmed by other studies (e.g., Karras 1996 and De Long and Summers 1988).

(1988) associate this view with credit rationing in the monetary transmission mechanism. They argue that positive nominal shocks have a smaller effect on aggregate demand and thus also a smaller effect on prices (assuming a linear supply curve). Our results support this second type of model (see Karras 1996).

Finally, section 4.2 showed that in nearly all countries, firms facing stronger competitive pressures tend to change their prices significantly more often than those not subject to such pressures. Thus, we expect the degree of competition to matter also in shaping pricing behavior when it comes to the driving forces of price adjustment. The influence of competition is shown separately for price-raising shocks in figure 4 and price-decreasing shocks in figure 5. As the differences between countries are limited, we present average scores for the euro area for two types of firms, namely, those facing either severe or limited competition.

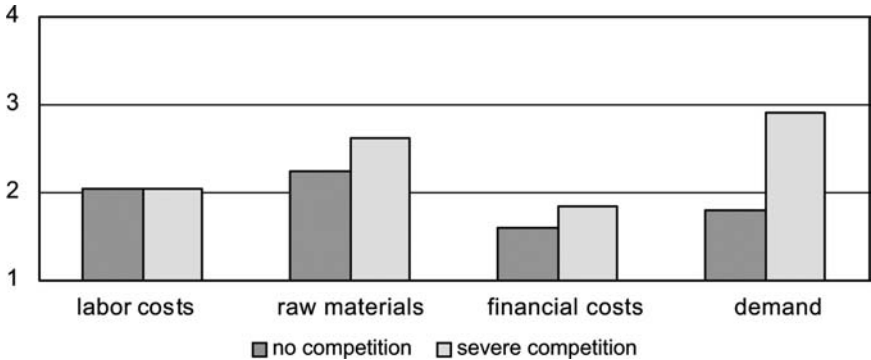
The degree of competition indeed matters. For firms in highly competitive markets, cost and demand factors are more important in driving price adjustment. The differences between the two groups are largest in the case of price-decreasing shocks, especially on the demand side. Interestingly, the results of the national surveys suggest that responses to labor cost shocks are more or less the same regardless of the degree of competition. An explanation might be that in most euro-area countries, wage adjustments are the outcome

**Figure 4. Perceived Competition and Price-Raising Factors in the Euro Area**  
(Average Scores)<sup>a</sup>



<sup>a</sup>Unweighted averages of countries' scores.

**Figure 5. Perceived Competition and Price-Reducing Factors in the Euro Area**  
*(Average Scores)<sup>a</sup>*



<sup>a</sup>Unweighted averages of countries' scores.

of yearly or half-yearly collective bargaining agreements at the national or sectoral level and, thus, all firms in a sector are equally affected.

*Stylized Fact 11: Firms in highly competitive markets are more likely to respond to changes in underlying factors, especially in the case of demand shocks.*

5.2 Price Adjustment after Shocks

Five countries (ES, FR, LU, AT, and PT) investigated further the issue of price reactions after shocks, focusing also on the time lag of the price response. Firms were asked whether they change their prices in reaction to a specific shock or not. In the case of a positive answer, they were requested to indicate the time (number of months) elapsed before the price change is implemented.

Table 11 presents the share of respondents who answered that they hold their prices constant in reaction to a specific shock. The results support the same conclusion about asymmetries as the previous section, though the issue is approached from a different angle: lower demand is more likely to lead to price adjustments than higher demand, while the opposite is true for cost shocks. Moreover, comparing the first and third columns, we observe that a larger share of firms adjust their price in reaction to increasing costs than to

**Table 11. Speed of Price Adjustment  
after Different Kinds of Shocks  
(Percentages)<sup>a</sup>**

	Higher Demand	Lower Demand	Higher Costs	Lower Costs
<b>ES</b>				
<i>&lt; 1 month</i>	18	21	15	13
<i>1–3 months</i>	17	21	18	18
<i>&gt; 3 months</i>	65	58	67	69
<b>FR</b>				
<i>&lt; 1 month</i>	35	37	34	31
<i>1–3 months</i>	34	35	27	29
<i>&gt; 3 months</i>	31	28	39	40
<b>LU</b>				
<i>&lt; 1 month</i>	34	42	47	40
<i>1–3 months</i>	24	31	25	28
<i>&gt; 3 months</i>	42	27	28	32
<b>AT</b>				
<i>&lt; 1 month</i>	4	3	2	2
<i>1–3 months</i>	51	71	65	61
<i>&gt; 3 months</i>	45	26	33	37
<b>PT</b>				
<i>&lt; 1 month</i>	22	28	24	23
<i>1–3 months</i>	31	32	27	33
<i>&gt; 3 months</i>	47	40	49	44
<sup>a</sup> Share of respondents who answered that they hold their prices constant for the number of months indicated in the table in reaction to a specific shock. Rescaled figures excluding nonresponses.				

higher demand, which further corroborates what we found in previous sections.

The median firm changes its price one to three months after a shock in France, Luxembourg, Austria, and Portugal, while the median firm in Spain waits for more than three months—regardless

of the sign and source of the shock. Thus, an adjustment process of one quarter in macro models for France, Luxembourg, Austria, and Portugal and of two or more quarters for Spain seems to be justified by these findings.

## 6. Conclusions

The responses collected from around 11,000 euro-area companies, mainly in the manufacturing sector, surveyed by nine central banks of the euro area shed light on important aspects of the price-setting behavior, which can hardly be assessed otherwise. Compared to previous similar empirical works, the distinguishing characteristic of the research project summarized in this paper is that the results are very consistent across countries: they are neither affected by differences in the national questionnaires (such as the different wording of the questions, their ordering, the possible answer categories, etc.), nor by the way in which the surveys were carried out, nor by the economic conditions prevailing in the countries at the time the surveys were conducted. The analogy of the results weakens the arguments traditionally raised against the use of surveys—in particular, concerning the qualitative nature of the information gathered, the lack of a time dimension, and the degree of uncertainty that surrounds the quality of the answers provided by the respondents.

Regarding the reviewing stage of the price-setting process, our evidence suggests that both time- and state-dependent pricing strategies are applied by firms in the euro area. Around one-third of the companies follow mainly time-dependent pricing rules, while the remaining two-thirds use pricing rules with some element of state dependence. Although the majority of firms take into account a wide range of information, including past and expected economic developments, about one-third adopt a purely backward-looking behavior. The pattern of results lends support to the recent wave of estimations of hybrid versions of the New Keynesian Phillips curve including past inflation in order to explain inflation developments.

Two pieces of evidence from our surveys suggest that the model of perfect competition with the law of one price does not seem to be the blueprint for most of the goods and service markets in the euro area. Firstly, markup pricing is the dominant price-setting strategy adopted by firms in the euro area, indicating that these firms have



some form of market power and can set their prices above marginal costs. Secondly, price discrimination is a common practice. This suggests that models with monopolistic competition, like New Keynesian models, may be a better description for most goods and service markets than those models that assume perfect competition.

In most countries the modal number of price reviews lies in the range of one to three times per year, and in nearly all countries on which this report is based, the median firm changes its price once a year. The latter result is consistent with the evidence obtained by Álvarez et al. (2005) on the basis of micro-PPI data and is also largely in line with the findings on the frequency of price changes in euro-area consumer prices by Dhyne et al. (2005).

Among the structural characteristics explaining differences in the frequency of price adjustment, we find that companies operating in markets with severe competition review and adjust their prices more frequently. The degree of competitive pressures faced by firms indeed matters for pricing strategies. We provide evidence that the lower the level of competition, the more frequently firms use markup rules and the more likely they are to respond to changes in underlying factors (e.g., cost and demand factors potentially driving price changes).

Our results indicate that there are obstacles to price changes in the reviewing as well as the implementation stage of the price-setting process. However, in contrast to the suggestion of Ball and Mankiw (1994), informational costs, which are important at the reviewing stage of price setting, do not seem to be among the most important obstacles to price changes. The fear that a price adjustment could jeopardize customer relationships (expressed in the theories on implicit and explicit contracts) is found to be a much more important explanation for rigid prices. This finding is consistent with the results of Zbaracki et al. (2004), who conclude that one-quarter of the overall costs of changing prices is due to menu costs and information costs, while three-quarters are arising because customers dislike price changes. The implicit contract theory going back to Okun (1981), which was recognized as very relevant by our respondents, suggests that customers regard price increases in response to cost shocks as fairer than price adjustments in response to demand shocks. This finding ties in with Rotemberg (2005), who also argues that fairness is an important driving force in customers' buying decisions.

Finally, we provide evidence that firms adjust prices asymmetrically in response to shocks, depending on the source of the shock and the direction of the adjustment. Changes in costs are the main factor underlying price increases, whereas changes in market conditions (demand and competitors' prices) are the driving forces behind price reductions. Moreover, prices seem to be more flexible downward than upward in response to demand shocks, while the opposite result holds in the face of cost shocks.

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